Chapter 32
Prevention of Diabetes Related Health Complications

1.0 Main Points

In Saskatchewan, the Ministry of Health (Ministry) is ultimately responsible for ensuring that people with chronic diseases, such as diabetes, receive appropriate care. Diabetes is a chronic condition where the body does not produce enough insulin or cannot effectively use insulin to regulate blood glucose (sugar) levels.

The Canadian Diabetes Association estimates that there are currently 75,000 Saskatchewan people living with diabetes, and that this number will increase to 111,000 by 2020.[1] It also estimates that the economic burden of diabetes in Saskatchewan was $257 million in 2000, $419 million in 2010 and will increase to $532 million by 2020.[2] Diabetes-related health complications account for over 80% of diabetes costs.[3] People with diabetes are three times more likely than people without diabetes to be hospitalized at least once during a year,[4] and remain hospitalized five times as many days as people without diabetes.[5] The number of people with diabetes is increasing in the province (see **Figure 1**).

We audited the Ministry's strategies for preventing diabetes-related health complications in the province. As well, we examined how well two regional health authorities (Saskatoon Regional Health Authority and Kelsey Trail Regional Health Authority) translated Ministry strategies into programs for services.

This chapter does not report on the Ministry's efforts to prevent people from developing a chronic disease such as diabetes; rather, it focuses on the Ministry's efforts to help people with diabetes reduce or delay development of serious complications that often result from the disease. The Ministry's target is to reduce the hospitalization rate for treatment of complications from chronic diseases [including diabetes] by 50% by 2017.

With education, support and monitoring, most people with diabetes can manage their condition themselves. Oversight for the delivery of education and support services to people with diabetes should be provided by physicians. Physicians often work in conjunction with either Primary Health Care or Chronic Disease Management branches of the regional health authorities to deliver the services needed.

The Ministry has adopted recognized standards[6] for good diabetes care but has not yet developed and implemented strategies to ensure these standards are achieved. Strategies should have goals, objectives, targets and performance indicators to clearly define performance expectations.

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[1] Canadian Diabetes Association. (2011). At the tipping point: Diabetes in Saskatchewan. http://www.diabetes.ca/documents/get-involved/17620_Diabetes_Prog_Report_Saskatchewan_4.pdf. (1 Nov 2012).
[2] Ibid.
[3] Canadian Diabetes Association. *Diabetes: Canada at the tipping point – Charting a new path,* p.2. http://www.diabetes.ca/documents/get-involved/WEB_Eng.CDA_Report_.pdf. (1 Nov 2012).
[4] Public Health Agency of Canada. (2011). *Diabetes in Canada: Facts and figures from a public health perspective*, p.5. http://www.phac-aspc.gc.ca/cd-mc/publications/diabetes-diabete/facts-figures-faits-chiffres-2011/pdf/facts-figures-faits-chiffres-eng.pdf. (1 Nov 2012).
[5] Saskatoon Health Region. (2011). *Diabetes in Saskatoon Health Region: A report of the Medical Health Officer*, p.7. http://www.saskatoonhealthregion.ca/your_health/documents/PHO/SHR_Diabetes_Report_August2011.pdf. (1 Nov 2012).
[6] Standards published by the Canadian Diabetes Association. http://www.diabetes.ca/files/cpg2008/cpg-2008.pdf. (1 Nov 2012).

The Ministry does not collect sufficient information related to diabetes. We found the Ministry does not know:

- Who has diabetes in the province
- The full cost of health care for people with diabetes in the province
- If people with diabetes receive all the recommended care that could reduce their risk of developing diabetes-related health complications
- Whether the recommended care is delivered effectively and consistently across the province

Without sufficient information, it is difficult for the Ministry to set strategies or to assess if its strategies will be effective in reducing diabetes-related health complications. Investing in information will enable a better quality of life for people with diabetes and long-term savings from effective diabetes management and the prevention or reduction of diabetes-related health complications. The Ministry should make its information about diabetes available to regional health authorities to help them assess the effectiveness of regional program delivery and hold them accountable for their performance.

In addition, the Ministry should periodically report progress in developing and implementing its strategies and achieving its goals and objectives.

We provided the Ministry with 12 recommendations that, if implemented, may contribute to the achievement of the Ministry's target to reduce avoidable hospitalizations for the treatment of chronic diseases.

Overall, we found the two regional health authorities followed best practice standards, delivered programs to reduce diabetes-related health complications and collected some information on their programs. They cannot know, however, if their programs are effective because of two things. First, they have not received current strategic direction from the Ministry and second, there is no centralized information system to collect needed data related to diabetes. Once the Ministry has clarified its strategies and provided a system for analysis of information, regional health authorities may be able to evaluate their progress and assess their alignment with Ministry strategies. They could then provide better, consistent and effective service to people with diabetes.

2.0 Introduction

Diabetes is defined as a chronic condition that arises when the pancreas does not produce enough insulin (Type 1 diabetes) or when the body cannot effectively use the insulin produced (Type 2 diabetes) or both.[7] This insulin imbalance inhibits the ability of the body to regulate its blood glucose (sugar) levels. Without proper management of the disease, people with diabetes are at serious risk of developing diabetes-related health complications.

[7] Saskatchewan Ministry of Health. 2004. *The Provincial Diabetes Plan*, p.51. http://www.health.gov.sk.ca/diabetes-provincial-plan. (1 Nov 2012).

Most people with diabetes can lead independent lives. With proper self-management and monitoring, people with diabetes can stabilize their condition to minimize and delay potential harmful health complications of the disease and improve the quality of their lives. Depending on the type of diabetes a person has, more or less aggressive management is required. For example, people with Type 2 diabetes can usually self-manage their disease with glucose-lowering oral medications, diet, exercise and weight loss. People with Type 1 diabetes typically need insulin injections to stabilize their blood glucose as well as a diet and exercise regime. Overall, 90% of people with diabetes have Type 2 diabetes, 10% have Type 1.[8]

Chronic disease management differs significantly from serious health episodes. Much of the management of a chronic disease has to be self-managed by the patient over a long period of time with significant involvement of numerous health professionals,[9] as opposed to serious health episodes which are typically dealt with over a short term in an acute care setting. Ideally, a team-based approach[10] for delivering the various aspects of chronic care is needed, and this approach has been adopted in both regional health authorities we visited to help people self-manage.

All people are at risk of developing diabetes. However, certain groups of individuals with a common trait/heritage (e.g., obesity, lower socio-economic status, Aboriginal, South Asian, etc.) have higher than normal rates of incidence and prevalence[11] of diabetes;[12] men are equally likely to develop diabetes as women, but men have higher rates of diabetes-related complications for all complications than women;[13] people in low and middle income brackets have higher rates of diabetes-related complications than affluent people;[14] and, age increases the risk of developing diabetes.[15]

3.0 Background

In 1997, the Ministry initiated the Saskatchewan Advisory Committee on Diabetes (Committee). The Committee was asked to provide a report to the Chief Medical Health Officer that would:

- Identify, summarize, review and evaluate diabetes services currently available to Saskatchewan people
- Recommend strategies in keeping with a population health promotion approach, for educational, preventive and treatment services addressing diabetes, which meet acceptable standards and which are feasible within available resources

[8] Canadian Diabetes Association. *Diabetes: Canada at the tipping point – Charting a new path,* p.8. http://www.diabetes.ca/documents/get-involved/WEB_Eng.CDA_Report_.pdf. (1 Nov 2012).
[9] Health professionals typically include physicians, nurse practitioners, nurses, dieticians, diabetes educators, pharmacists, exercise therapists, and various specialized doctors such as endocrinologists and paediatricians.
[10] Lewanczuk, R. (December 2009). Diabetes and chronic disease management. *Canadian Journal of Diabetes*. http://www.diabetes.ca/publications/cjd/2009/12/. (31 Oct 2012).
[11] The Ministry of Health defines "Incidence" as the number of new cases detected in the population at risk for the disease during a specific period; "Prevalence" is the total number of people known to be living with a disease at any time during a specific period.
[12] Public Health Agency of Canada. (2011). *Diabetes in Canada: Facts and figures from a public health perspective*, p.5. http://www.phac-aspc.gc.ca/cd-mc/publications/diabetes-diabete/facts-figures-faits-chiffres-2011/pdf/facts-figures-faits-chiffres-eng.pdf. (1 Nov 2012).
[13] Saskatoon Health Region. (2011). *Diabetes in Saskatoon Health Region: A report of the Medical Health Officer*, p.27. http://www.saskatoonhealthregion.ca/your_health/documents/PHO/SHR_Diabetes_Report_August2011.pdf. (1 Nov 2012).
[14] Ibid.
[15] Public Health Agency of Canada. (2011). *Diabetes in Canada: Facts and figures from a public health perspective*, p.20. http://www.phac-aspc.gc.ca/cd-mc/publications/diabetes-diabete/facts-figures-faits-chiffres-2011/pdf/facts-figures-faits-chiffres-eng.pdf. (1 Nov 2012).

- Recommend research approaches aligned with the recommended services, which would ultimately serve to demonstrate the efficacy and cost-effectiveness of the recommended strategies

- Identify an optimal system(s) of health service delivery for people with diabetes

The Committee's March 2000 report[16] recommended goals, objectives and actions that were designed to help guide strategies to reduce, through prevention, the incidence and prevalence of diabetes and its complications. It also addressed surveillance, education, care and treatment of persons with the disease.

In February 2004, the Ministry released *The Provincial Diabetes Plan* (Plan) that was developed based on the recommendations of the Committee. Two program components of the Plan related to preventing diabetes-related health complications; "optimum care for prevention" and "diabetes surveillance." We determined that about half of the objectives relating to the components had been implemented or partially implemented by March 31, 2012. See **Exhibit 1** for additional information on these program components.

In 2007, the Premier's mandate letter asked the Minister of Health to "strengthen provincial efforts to promote [as a priority] wellness and preventive care through education, nutrition and physical activity."

In 2008, the Ministry began developing an alternate, comprehensive strategy for chronic disease based on the Expanded Chronic Care Model endorsed by the World Health Organization (see **Exhibit 2**). The Model links people with their health system and community, and envisions the development of skills and provision of supports to improve health outcomes for people overall and individuals with respect to their personal health outcomes. The RHAs continue to deliver programs and services developed as part of *The Provincial Diabetes Plan*.

The Ministry's *Strategic and Operational Directions 2011-12* identifies the goal to "improve population health through health promotion, protection and disease prevention."[17]

In 2012, the Saskatchewan Advisory Committee on Diabetes was disbanded.

4.0 Significance and Risk

The Canadian Diabetes Association estimates that there are currently 75,000 Saskatchewan people living with diabetes, and that this number will increase to 111,000 by 2020.[18] It also estimates that the economic burden of diabetes in Saskatchewan was

[16] Report of the Saskatchewan Advisory Committee on Diabetes. (2000). *Diabetes 2000: Recommendations for a strategy on diabetes prevention and control in Saskatchewan.* http://www.health.gov.sk.ca/diabetes-report-2000. (1 Nov 2012).
[17] Saskatchewan Ministry of Health. *Strategic and Operational Directions 2011-12*, p.6. http://www.finance.gov.sk.ca/PlanningAndReporting/2011-12/HealthPlan1112.pdf. (1 Nov 2012).
[18] Canadian Diabetes Association. (2011). At the tipping point: Diabetes in Saskatchewan. http://www.diabetes.ca/documents/get-involved/17620_Diabetes_Prog_Report_Saskatchewan_4.pdf. (1 Nov 2012).

$257 million in 2000, $419 million in 2010 and will increase to $532 million by 2020.[19] Diabetes-related health complications account for over 80% of diabetes costs.[20]

Many Canadians with diabetes will develop serious, potentially fatal diabetes-related health complications. For example:

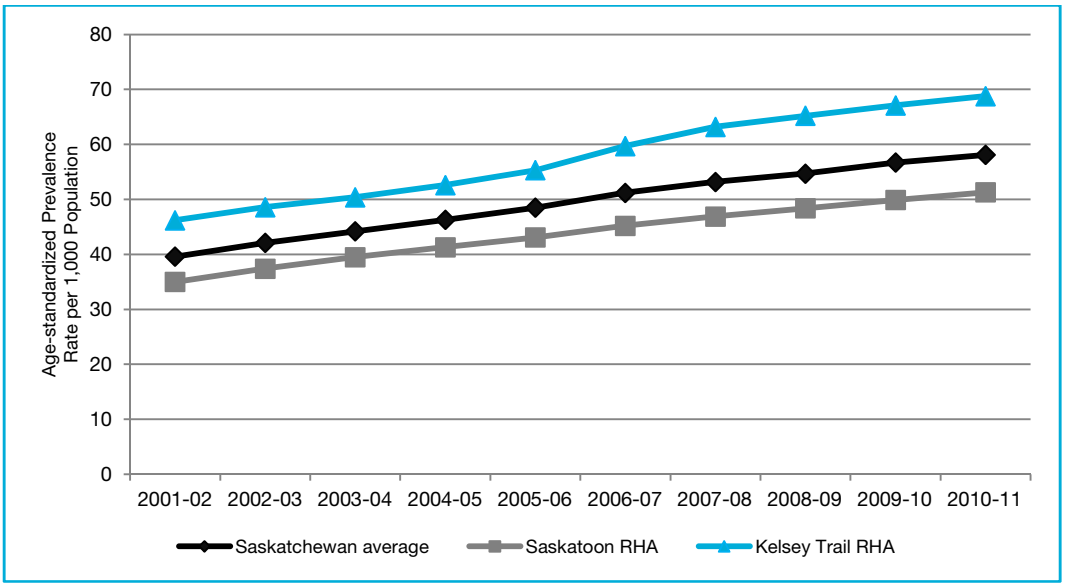
- Diabetic retinopathy is the single leading cause of blindness in Canada
- Over 40% of new kidney dialysis patients have diabetes
- 70% of non-traumatic limb amputations due to nerve disease are caused by diabetes complications
- 80% of Canadians with diabetes die from a heart attack or a stroke
- 25% of people with diabetes suffer from depression due to the burden of coping with the disease, as well as discrimination and stigma that often accompany diabetes[21]
- People with diabetes are three times more likely than people without diabetes to be hospitalized at least once during a year,[22] and remain hospitalized five times as many days as people without diabetes.[23]

As the economic burden of diabetes in Saskatchewan is estimated to be $532 million by 2020, the Ministry needs to know the amount of provincial funding that is spent on helping people with diabetes to self-manage their disease and the amount that is spent on treatment for diabetes-related health complications. The Ministry does not track costs specifically associated with programs for diabetes. The Ministry could not tell us the total cost of treating diabetes or diabetes-related complications in Saskatchewan acute care facilities (e.g., dialysis, amputation, heart attack or stroke) or by physicians, long-term care, home care or primary health care providers.

Figure 1 below shows the trend in prevalence of diabetes in Saskatchewan and each regional health authority (RHA) over the last ten years. Prevalence rates record the total number of people known to be living with a disease at any time during a specific period. The prevalence rate is increasing because more people are newly diagnosed in a year than are lost to death in the year. Prevalence rates are an indicator of the increasing burden the health system will have to address in the future, as increasing numbers of people with diabetes may require significant care.

[19] Canadian Diabetes Association. (2011). *At the tipping point: Diabetes in Saskatchewan*. http://www.diabetes.ca/documents/get-involved/17620_Diabetes_Prog_Report_Saskatchewan_4.pdf. (1 Nov 2012).
[20] Canadian Diabetes Association. *Diabetes: Canada at the tipping point – Charting a new path,* p.2. http://www.diabetes.ca/documents/get-involved/WEB_Eng.CDA_Report_.pdf. (1 Nov 2012).
[21] Ibid., p.37.
[22] Public Health Agency of Canada. (2011). *Diabetes in Canada: Facts and figures from a public health perspective*, p.5. http://www.phac-aspc.gc.ca/cd-mc/publications/diabetes-diabete/facts-figures-faits-chiffres-2011/pdf/facts-figures-faits-chiffres-eng.pdf. (1 Nov 2012).
[23] Saskatoon Health Region. (2011). *Diabetes in Saskatoon Health Region: A report of the Medical Health Officer*, p.7. http://www.saskatoonhealthregion.ca/your_health/documents/PHO/SHR_Diabetes_Report_August2011.pdf. (1 Nov 2012).

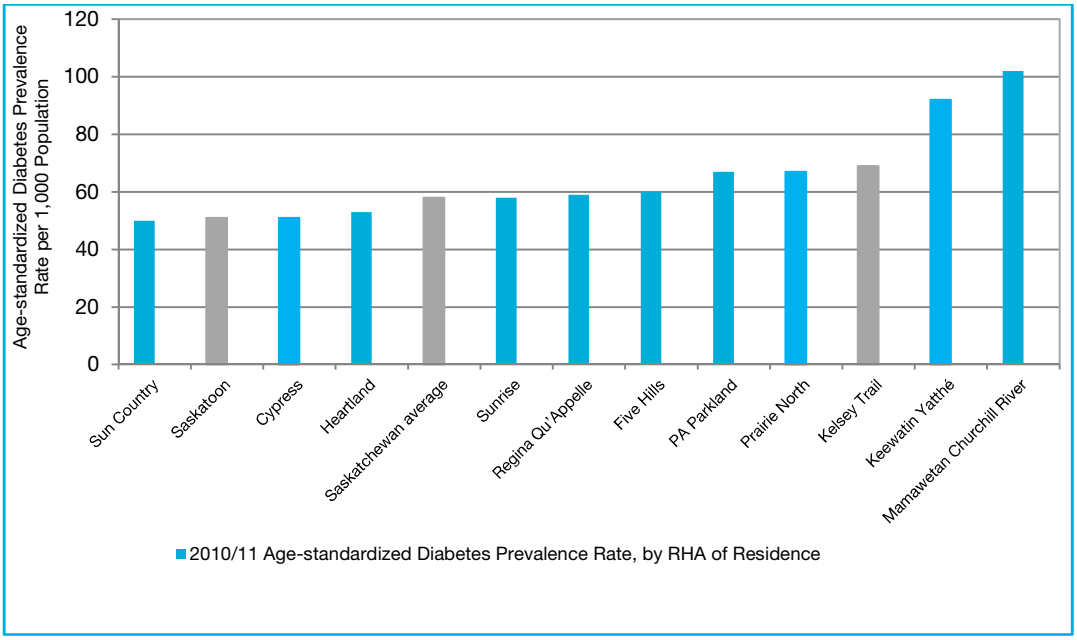
Figure 1—2001-02 to 2010-11 Age-standardized Prevalence Rates per 1,000 population for Saskatchewan, Saskatoon RHA and Kelsey Trail RHA



Source: Saskatchewan Ministry of Health, Population Health Branch. Information for year ending March 31 each year.

Figure 2 below shows the variation in prevalence among the regions and how they compare to the provincial average. This demonstrates that certain regions have a greater burden of diabetes than others, and efforts should be tailored to regional needs.

Figure 2—2010-11 Age-standardized Prevalence Rates per 1,000 Population by RHA of Residence



Source: Saskatchewan Ministry of Health, Population Health Branch

Kelsey Trail has the third highest prevalence rate (69 per thousand population). Saskatoon RHA has the second lowest prevalence rate (51 per thousand population). The Saskatchewan average prevalence rate is 58 people per thousand population.

5.0 AUDIT OBJECTIVE, SCOPE, CRITERIA, AND CONCLUSION

The objective of this audit was to assess whether the Ministry of Health and regional health authorities (RHAs) had effective strategies for preventing diabetes-related health complications for the year ended March 31, 2012.

To conduct this audit, we followed *The Standards for Assurance Engagements* published in the *CICA Handbook - Assurance*. We examined how effectively the Ministry develops and evaluates strategies, and delivers programs for preventing diabetes-related health complications, and their processes to collect data on their strategies and programs. We also examined how well the Kelsey Trail Regional Health Authority (Kelsey Trail) and Saskatoon Regional Health Authority (Saskatoon RHA) deliver and evaluate programs to implement the strategies, and their processes to collect data on their programs. We interviewed key managers and staff at the Ministry and the two RHAs.

We chose to examine Kelsey Trail RHA because of the relatively high prevalence rate of diabetes in the region as well as an example of a mid-size regional health authority in the province. We chose Saskatoon RHA because of the relatively low prevalence rate of diabetes in the region and the size of the region in relation to other RHAs in the province. See Section 7.0 Regional Findings for further information on each RHA.

To evaluate the Ministry and RHAs' processes, we used criteria based on the work of other auditors and current literature listed in the selected references. The Ministry and the two RHAs agreed with the criteria in **Figure 3**.

Figure 3—Audit Criteria

Part 1: To have effective strategies for preventing diabetes-related health complications, the Ministry of Health should:
1. Develop an overall plan for managing diabetes 1.1. develop strategy for managing diabetes 1.2. set goals and objectives including performance indicators and targets 1.3. allocate resources to develop and deliver programs to achieve objectives 2. Ensure RHAs develop and deliver programs for managing diabetes to achieve goals and objectives 2.1. review planned programs from RHAs 2.2. assess alignment of programs with the Ministry's strategies 3. Evaluate strategies for managing diabetes and take action 3.1. develop mechanism to collect data 3.2. collect and analyze data to assess progress towards the goals and objectives 3.3. adjust strategies as required to achieve objectives 3.4. report results publicly
Part 2: To have effective strategies for preventing diabetes-related health complications, the Regional Health Authorities should:
1. Develop and deliver programs for managing diabetes to achieve goals and objectives 1.1. develop guidelines for diabetes care based on best practice 1.2. deliver and/or collaborate with community partners to deliver programs for managing diabetes 1.3. allocate resources to deliver programs for managing diabetes 2. Evaluate programs for managing diabetes and take action 2.1. develop mechanism to collect data 2.2. collect and analyze data to assess progress towards the goals and objectives 2.3. adjust strategies and programs as required to achieve objectives 2.4. report results publicly

We concluded that, for the year ended March 31, 2012, the Ministry of Health did not have effective strategies for preventing diabetes-related health complications. The Ministry needs to implement its work plan for management of diabetes and diabetes-related health complications and provide related guidance to regional health authorities by setting goals, objectives and performance indicators. To be effective in reducing the health care burden associated with diabetes, it is important that the Ministry collect patient information and cost information to enable effective programming decisions to be made.

The two regional health authorities deliver programs for people with diabetes. However, these programs are, at times, ad hoc, because the regional health authorities lack strategic direction from the Ministry about provincial goals and objectives and do not have enough information to know if their programs are effective. Until the Ministry implements its work plan, provides guidance, and puts a system in place to collect needed data, we encourage all regional health authorities to work together and share their program information.

6.0 Ministry Findings and Recommendations

6.1 Develop an Overall Plan for Managing Diabetes

6.1.1 Develop Strategy for Managing Diabetes

We expected the Ministry to have a strategy and overall plan for services for people with diabetes that would help them self-manage their diabetes and reduce and/or delay diabetes-related health complications.

As noted in Section 3.0, the Ministry has had many diabetes-specific initiatives and done considerable planning over the past 15 years. However, these efforts have not resulted in a sustainable and actionable plan for services for people with diabetes. Strategic planning is now focused on overall chronic disease management, recognizing that many people have more than one chronic disease, consistent with the Expanded Chronic Care Model (**Exhibit 2**). The Ministry indicated that plans for diabetes management and reduction of complications will be developed as part of the following:

- In May 2012, the Ministry released the *Saskatchewan Framework for Primary Health Care Report*. This framework acknowledges the need for a proactive approach to chronic disease prevention and management and the need for a province-wide vision, measurable goals, and a focus on modifiable risk factors and the social determinants of health (see **Exhibit 3**).

- The Ministry's *Plan for 2012-13* identifies a broad strategy for "better health" to "improve population health through health promotion, protection and disease prevention, and collaborating with communities and different government organizations to close the health disparity gap." The strategy includes:
  - Five-year outcome:

- to reduce the hospitalization rate for ambulatory care sensitive conditions[24] by 50% by 2017 [i.e., hospitalizations due to complications of chronic disease that may have been avoidable with appropriate preventative treatment]

- Three improvement targets:
  - 75% of people with chronic diseases with increased confidence in ability to self-manage their disease by 2017
  - 80% of people with chronic disease receiving care consistent with provincial standards by 2017
  - 80% of primary health care teams are using an electronic medical record to facilitate individual patient care and enable population-based reporting for quality improvement and planning by 2017
- "Breakthrough initiative":
  - to identify the tools and supports (capacity and baseline capability in measurement and analysis) required to monitor chronic disease population data, by March 31, 2013

- In response to the Ministry's *Plan for 2012-13*, the Primary Health Services Branch of the Ministry developed a work plan indicating the Ministry plans to:
  - Define five chronic diseases [including diabetes] and the best practice standards for each by 2013-14
  - Establish standard work (practices, processes, policies) by 2014-15
  - Ensure all RHAs have the tools and supports necessary to monitor chronic disease outcome data by 2014-15
  - Ensure all RHAs have a defined chronic disease management strategy as part of their Primary Health Care plan by 2014-15

Work continues in developing a sustainable and actionable work plan. Without such a plan in place, money spent on diabetes initiatives may not result in coordinated and effective programs and services.

1. **We recommend the Ministry of Health implement an actionable work plan relating to chronic disease management including diabetes and prevention of diabetes-related health complications and provide guidance for regional health authorities.**

6.1.2 Develop Goals and Objectives Including Performance Indicators and Targets

We expected the Ministry to have goals and objectives for delivering services to people with diabetes to help them self-manage their diabetes and reduce and/or delay diabetes-related health complications. We also expected the Ministry to determine indicators to measure the health system's performance, and targets to indicate expected progress.

[24] Hospitalizations related to ambulatory care sensitive conditions (ACSC) represent an indirect measure of access to primary care and the capacity of the system to manage chronic conditions such as diabetes, congestive heart failure, chronic obstructive pulmonary disease (COPD) and asthma. ACSC-related hospitalizations are commonly referred to as avoidable hospitalizations and thus a measure of the performance of the primary care system. Sanmartin,C., Khan, S. & the Longitudinal Health and Administrative Data Research Team. *Hospitalizations for ambulatory care sensitive conditions (ACSC): The factors that matter.* http://www.statcan.gc.ca/pub/82-622-x/82-622-x2011007-eng.htm. (08 Nov. 2012).

As described above, the Ministry, in its *2012-13 Plan,* has set a broad strategy to promote better health, along with broad performance indicators and targets related to chronic disease. It has not yet translated this into specific strategies for managing chronic disease. Nor has it set goals, objectives, performance indicators or targets that relate to diabetes and diabetes-related health complications.

Most people with diabetes can manage their disease themselves if they receive appropriate education and have appropriate support and monitoring from health professionals, including regular clinical checks for early indications of the disease's progression (for examples of such checks, refer to **Exhibit 4**). Early detection of these indicators and appropriate management reduces the risk of developing serious complications. Even though physicians must ensure their patients with diabetes receive appropriate care and monitoring, the Ministry's standard work (practices, processes, policies) should require regular clinical checks.

Currently, the Ministry does not have information available to know whether people with diabetes are appropriately monitored and that appropriate interventions are taking place to reduce the risk of developing complications. It also is unable to know whether people with diabetes receive the same level of service and monitoring by clinicians.[25] Investing in information will enable a better quality of life for people with diabetes and long term savings from effective diabetes management and the prevention or reduction of diabetes-related health complications. See Section 6.3 for further information on collection and analysis of data.

2. **We recommend the Ministry of Health set goals, objectives, performance indicators and targets to manage diabetes and prevent diabetes-related health complications.**

3. **We recommend the Ministry of Health establish processes to monitor that people with diabetes receive appropriate services to reduce their risk of developing diabetes-related health complications.**

4. **We recommend the Ministry of Health establish processes to monitor that people with diabetes have access to appropriate services in the province.**

6.1.3 Assess Resources to Develop and Deliver Programs

We expected the Ministry to allocate resources to develop and deliver programs to aid people with diabetes to help them self-manage their diabetes and reduce and/or delay diabetes-related health complications.

[25] Clinicians (i.e., physicians, licensed practical nurses, primary health care teams, etc.) deliver clinical care.

As described in Section 4.0, the Ministry does not know how much is spent on diabetes management and treatment of diabetes-related health complications. Treating diabetes complications is a significant cost to the health care system (currently estimated at 80% of the Canadian Diabetes Association estimated $419 million spending on diabetes in 2010). Knowing how much money is spent on treating people with diabetes, separate from other initiatives, would help determine if programs help people to self-manage, and consequently, reduce the burden on the health care system in the future. In addition, it would help the Ministry when making provincial funding decisions.

The Ministry provides RHAs with global funding annually. RHAs have discretion in allocating funding to primary health care and chronic disease management. The amount allocated varies by RHA. The Ministry has not provided guidelines to the RHAs to help decide how much of the global funding should be spent on chronic disease, or more specifically diabetes management and diabetes-related health complications.

Guidelines on resource allocation would be helpful, recognizing the disparity in prevalence of diabetes among regions, as well as the number of people with diabetes in a region (refer to **Figure 2** for prevalence rates by RHA). For example, a smaller region with a very high prevalence rate might still have a small number of people with diabetes. Conversely, a larger region with a lower prevalence rate might still have a large number of people with diabetes. RHAs may need different programs given the prevalence rate and number of people with diabetes in a region.

Apart from the global funding provided to the RHAs, the Ministry spends other funds to provide services for people with diabetes. For example:

- The Ministry specifically grants about $600,000 annually to RHAs for chronic disease management projects (on average about $50,000 per RHA) typically used to fund pilot programs or specific initiatives related to chronic diseases including diabetes. If RHAs want to sustain or expand the programs, they must use their global funding in subsequent years.

- The Ministry pays for diabetes-related services provided by physicians. Physicians provide diabetes services and should monitor certain indicators (see **Exhibit 4**) as best practice. The Ministry has no mechanism to know if physicians are monitoring people with diabetes effectively and consistently. Since 2011, the Ministry agreed with the Saskatchewan Medical Association (SMA) to an increase in annual funding of $3 million, to improve and increase services physicians provide for chronic disease treatment and management. The Ministry works with the SMA to determine the distribution of the additional funding to physicians in the province. The contract with the SMA does not require the linking of payments to activities or outcomes.

- In December 2011, the Ministry announced its plan to fund an additional $2.5 million to expand insulin coverage for people with diabetes, and the insulin pump program to people with diabetes up to and including the age 25 (previously the program funded people up to and including age 17). However, the Ministry has not yet done a study to determine if the insulin pump program is effective in improving self-management by people with diabetes.

- The Ministry helps low-income people with the cost of diabetes drugs and supplies through the Prescription Drug Plan. In 2011-12, the Ministry paid $22.7 million of these costs.

- The Ministry developed and maintains a website[26] and HealthLine telephone services to disseminate information for people with diabetes and their care providers. The website has over 1,200 individual articles on five main categories of diabetes. This amount of information may be overwhelming for the average person seeking guidance on self-management or care providers wanting to access specific information.

5. **We recommend the Ministry of Health implement processes to accumulate, analyze and monitor provincial spending information on people with diabetes, and on diabetes-related complication prevention programs to assess the reasonableness of its resource allocations.**

6. **We recommend the Ministry of Health work with the Saskatchewan Medical Association to establish a method for assessing physician activities in monitoring people with diabetes.**

7. **We recommend the Ministry of Health work with regional health authorities to ensure resources on a regional basis are effectively deployed to manage diabetes and diabetes-related health complications.**

6.2 Ensure RHAs Develop and Deliver Appropriate Programs

6.2.1 Review RHAs Planned Programs and Assess Alignment of Programs with the Ministry's Strategies

We expected the Ministry to review programs delivered by the RHAs for managing diabetes and diabetes-related health complications.

When *The Provincial Diabetes Plan* was implemented in 2004, the RHAs reported to the Ministry annually on their goals and objectives. Since 2008, RHAs have not been required to report this information annually.

In 2011, the Ministry requested and received preliminary Primary Health Care plans from all RHAs. The plans we examined had few actions related to chronic disease and did not specifically address management of diabetes or diabetes-related health complications.

The Ministry's Primary Health Care work plan identifies the need to ensure all RHAs have a defined chronic disease management strategy as part of their Primary Health Care

[26] www.health.gov.sk.ca/healthline-online. (1 Nov 2012).

plan by 2014-15. The Ministry indicated that diabetes would be one of the chronic diseases addressed.

We expect the Ministry to review the RHAs' chronic disease management strategies when they are developed in 2014-15, and to request and review on-going reporting by the RHAs on their progress in achieving province-wide goals and objectives.

We also expected the Ministry to assess whether the RHAs' programs aligned with the Ministry's strategies.

The Ministry said it has reviewed the 2011 RHA preliminary Primary Health Care plans to ensure these plans align with the Ministry's plan and the broader primary health care framework. The Ministry did not provide written evidence of this review. As noted above, the RHA preliminary plans we examined had few actions related to chronic disease and did not specifically address management of diabetes or diabetes-related health complications. The Ministry has not informed the RHAs whether those plans need to change to align with the Ministry's direction.

In Section 6.1.1, we recommended that the Ministry provide guidance for regional health authorities. This guidance should include strategies, objectives, targets and performance indicators.

8. **We recommend the Ministry of Health review regional health authorities' Primary Health Care plans and programs to ensure they contain appropriate actions and align with the Ministry's strategies relating to chronic disease management including diabetes management and prevention of diabetes-related health complications.**

6.3 Evaluate Strategies for Managing Diabetes and Take Action

6.3.1 Develop Mechanisms to Collect Data for Diabetes Management

We expected the Ministry to collect data that is useful to people with diabetes, their care providers, regional health authorities and the Ministry to manage diabetes and diabetes-related health complications.

As described earlier, the Ministry does not have complete information available to know whether people with diabetes are appropriately monitored and interventions have taken place to reduce their risk of developing complications. It also is unable to determine whether people with diabetes in the province receive the same level of service and monitoring by clinicians. The Ministry has identified, in its *Plan for 2012-13,* the need to ensure that people with chronic diseases including diabetes receive care consistent with provincial standards (see **Exhibit 4**), and has set a target for improvement to 80% by 2017 (see Section 6.1.1).

The Ministry needs to determine what information to collect, how, and by whom. Also, it needs mechanisms to make the information available and useful to stakeholders who need the information to help people with diabetes self-manage their disease. Stakeholders include individuals with diabetes, their care providers including physicians, and the regional health authorities that deliver programs on the Ministry's behalf.

9. We recommend the Ministry of Health implement processes to gather sufficient information relating to people with diabetes and diabetes-related health complications to ensure they are receiving care consistent with provincial standards.

6.3.2 Collect and Analyze Data to Assess Programs' Effectiveness

We expected the Ministry to collect and analyze data about the effectiveness of services and programs.

Effectiveness of Services

As described in Section 6.3.1, the Ministry does not have a process to ensure that people with diabetes receive services recommended as best practice (see **Exhibit 4**), are appropriately monitored and are appropriately helped to reduce their risk of developing complications. The Ministry collects statistical data on some complications, but cannot link complications to care provision or lack thereof. As well, the Ministry cannot ensure that people with diabetes receive needed services and monitoring throughout the province.

With data on services delivered by physicians and care providers linked to patient outcomes, the Ministry may be able to identify patterns of good service delivery and gaps in service delivery. It may then be able to adjust programs to aid physicians and other care providers to provide better care and monitoring to reduce diabetes-related health complications.

10. We recommend the Ministry of Health collect and analyze information to assess whether services delivered by physicians and care providers are effective and if they provide needed services to people with diabetes to prevent diabetes-related health complications.

Effectiveness of Programs

The Ministry does not collect data to see if the RHAs' programs are successful in improving the ability of people with diabetes to self-manage their disease or in preventing or reducing future diabetes-related health complications. Also, the Ministry does not have information needed to do a cost-benefit analysis to assess which programs are successful in improving patient outcomes efficiently.

The Ministry cannot provide relevant information to RHAs that are delivering programs. For example, the Ministry could track certain health indicators (see **Exhibit 4**) for people enrolled in a program versus people with diabetes not enrolled in a program. Without such feedback, the RHAs cannot know if their programs are effective in aiding self-management for people with diabetes.

11. We recommend the Ministry of Health collect and analyze information to assess the effectiveness of regional health authorities' programs to manage diabetes and the prevention of diabetes-related health complications.

6.3.3 Adjust Strategies as Required to Achieve Objectives

We expected the Ministry to adjust its strategies based on data collected on Ministry and RHA initiatives to improve people with diabetes' ability to self-manage and reduce and/or delay diabetes-related health complications.

As described in 6.1.1, the Ministry has adjusted its broad strategies for chronic disease management focusing on modifiable risk factors and the social determinants of health (see **Exhibit 3**). The Ministry is developing strategies in conjunction with other ministries such as Social Services and Education to address broad-based health issues and factors, such as socio-economic status and education, that affect population health and development of chronic diseases. These strategies may help reduce the number of people developing chronic diseases, including diabetes, (i.e., reduce incidence rates), and may also help reduce and/or delay diabetes-related health complications.

Also, management stated the Ministry is adjusting broad strategies as part of its newly released Primary Health Care Framework to deal with chronic disease. As the Ministry does not have a mechanism to collect data, it may not have all the necessary information to assess if potential strategies will achieve its objectives.

Without specific information and guidance on strategies and programs for diabetes and diabetes-related health complications, RHAs cannot know if their programs are designed correctly and consistently, reach the intended population, and are achieving desired outcomes. Without performance targets and guidance on resource allocations (see Sections 6.1.2 and 6.1.3), the RHAs cannot know the Ministry's expectations for improving program delivery.

6.3.4 Report Results Publicly

We expected the Ministry to publish its goals and objectives, performance indicators and targets for preventing diabetes-related health complications and report on its progress in meeting its goals and objectives.

The Ministry annually publishes reports on its activities. The Ministry's annual reports do not specifically address results related to management of chronic diseases. The Ministry publishes some statistical information on diabetes (e.g., *Vital Statistics Annual Statistical Report* and *Medical Services Statistical Annual Report*). The Ministry periodically

publishes information on trends in diabetes incidence, prevalence and mortality rates, as well as information for regional comparisons. The last such report was the *Saskatchewan Diabetes Profile 2002-03 to 2006-07* published in 2010.

The Public Health Agency of Canada (PHAC) also publishes incidence and prevalence rates and rates of certain diabetes-related health complications on a biannual basis on a Canadian and provincial basis. As noted earlier, PHAC rates are typically 2 – 3 years old when published.

However, all of these reports are statistical in nature and are not useful in assessing whether strategies are achieving the desired goals and objectives.

12. We recommend the Ministry of Health publicly report progress in implementing its strategies to manage chronic diseases separately identifying diabetes and prevention of diabetes-related health complications.

7.0 REGIONAL FINDINGS

In this section, we set out a summary of our findings in **Figure 4** related to the audit criteria (in **Figure 3**) for Kelsey Trail Regional Health Authority and Saskatoon Regional Health Authority.

The Kelsey Trail Regional Health Authority (Kelsey Trail) is located in the mid north-east of the province and serves approximately 42,000 people in the region. The population is relatively dispersed. Kelsey Trail has the third highest prevalence rate in the province.[27] Over 14% of Kelsey Trail's population are Aboriginal.[28] As noted earlier, people with aboriginal ancestry have a significantly higher probability of developing diabetes than non-aboriginals.[29] Kelsey Trails' Aboriginal population has an incidence rate of diabetes twice as high as the provincial incidence rate.[30] We chose this region to audit because of the relatively high prevalence rate in the region and because it is a mid-size regional health authority in the province.

The Saskatoon Regional Health Authority (Saskatoon RHA) is located in the middle of the province and serves more than 318,000 people in the region. The population is relatively concentrated in the City of Saskatoon.[31] Saskatoon RHA has the second lowest prevalence rate in the province.[32] Saskatoon RHA's Aboriginal population is 9.3%.[33] We chose this region to audit because of the relatively low prevalence rate in the region and the size of the region in relation to other RHAs in the province.

[27] Saskatchewan Ministry of Health. Population Health Branch.
[28] Health Profile, June 2012: those persons who reported identifying with at least one Aboriginal group, that is, North American Indian, Métis or Inuit, and/or those who reported being a Treaty Indian or a Registered Indian, as defined by the *Indian Act of Canada*, and/or those who reported they were members of an Indian band or First Nation http://www12.statcan.gc.ca/health-sante/82-228/index.cfm?Lang=E. (31 Oct. 2012).
[29] Although delivery of health care on reserve is the responsibility of the federal government, once a person develops a diabetes-related health complication, they will likely be treated in an acute care facility, which is the responsibility of regional health authorities.
[30] Kelsey Trail Health Region. *Health Status Report 2010.*
[31] Statistics from the Saskatoon Health Region *Annual Report 2011-2012.*
[32] Saskatchewan Ministry of Health. Population Health Branch.
[33] http://www12.statcan.gc.ca/health-sante/82-228/index.cfm?Lang=E; Health Profile, June 2012.

The RHAs are not aware of all individuals with diabetes living in their region, nor the total costs associated with caring for people with diabetes in their regions.

Based on our assessment, Saskatoon RHA and Kelsey Trail have both implemented or partially implemented the three RHA-assigned objectives from the 2004 *Provincial Diabetes Plan* (refer to **Exhibit 1**). They have developed diabetes teams, developed relationships with primary health care teams, and have developed networks with some medical care specialists.

However, overall, RHAs are constrained in their ability to effectively deliver programs to reduce diabetes-related health complications because of a lack of strategic direction from the Ministry, lack of guidance on allocation of resources, and a lack of information to assess the effectiveness of their programs. Once the Ministry has clarified its strategies, provided resource guidance and provided a system for analysis of information, the RHAs may be able to provide better, consistent, efficient and effective services to people with diabetes at risk of developing diabetes-related health complications.

Figure 4—Summary of Findings by RHA

Criteria	Saskatoon RHA	Kelsey Trail RHA
1. Develop and deliver programs for managing diabetes to achieve goals and objectives		
1.1 Develop guidelines for diabetes care based on best practice:	✓ Saskatoon RHA use the Canadian Diabetes Association recommendations as guidelines when delivering services	✓ Kelsey Trail RHA use the Canadian Diabetes Association recommendations as guidelines when delivering services
	✓ Diabetes Educators, Dietitians and Exercise Therapists are certified	✓ Diabetes Educators, Dietitians and Exercise Therapists are certified
	✓ Saskatoon RHA has the Regional Diabetes Reference Group	
	✓ Chronic Disease Management staff participate in provincial initiatives (e.g., Insulin Task Force)	
	X Saskatoon RHA has no mechanism to ensure physicians follow best practice guidelines	X Kelsey Trail RHA has no mechanism to ensure physicians follow best practice guidelines
1.2 Deliver and/or collaborate with community partners to deliver programs	✓ Saskatoon RHA delivers most programs directly using team-based approach. Teams are primarily concentrated in the City of Saskatoon	✓ Kelsey Trail RHA delivers all programs directly using team-based approach. Teams are relatively dispersed due to the rural nature of the RHA's population
	✓ Programs include: - individual and group counseling and education services - peer support programs (LiveWell with Chronic Conditions) - exercise programs (in collaboration with the City of Saskatoon and other community partners) - rural program delivery	✓ Programs include: - individual counselling and education services - peer support programs (LiveWell with Chronic Disease) - exercise program

Criteria		Saskatoon RHA		Kelsey Trail RHA
		- specific programs to address barriers to access (e.g., location, language, cultural sensitivity, transportation) for high risk populations in collaboration with community partners	X	Kelsey Trail RHA has not assessed if it needs specific programs to address barriers to access but does deliver its programs in numerous locations to reduce transportation barriers
	✓	Saskatoon RHA diabetes educators routinely work in 16 physician practices/clinics (about 1/3 of physicians in region)	✓	Kelsey Trail RHA diabetes educators work with some physicians in clinics and with home care services
			✓	Kelsey Trail RHA runs pilot projects in certain communities to address complications (e.g., Cumberland House kidney disease pilot)
1.3 Allocate resources to deliver programs[34]	✓	Saskatoon RHA estimates it spends $2.45 million on direct costs of delivering programs	✓	Kelsey Trail RHA estimates it spends $0.5 million on direct costs of delivering programs
	X	Saskatoon RHA has identified gaps in service delivery and run pilot programs but said it could not allocate sufficient resources to address the gaps on a sustainable basis (e.g., no complex foot wound clinic, mental health counseling wait list)	X	Kelsey Trail RHA has run pilot programs to assess service delivery improvements, but could not allocate sufficient resources to expand successful pilot programs
2. Evaluate programs for managing diabetes and take action				
2.1 Develop mechanism to collect data	X	Saskatoon RHA has no mechanism to collect data to ensure that all people with diabetes in the region are receiving appropriate care	X	Kelsey Trail RHA has no mechanism to collect data to ensure that all people with diabetes in the region are receiving appropriate care
	X	Saskatoon RHA has no mechanism to collect data to track an individual with diabetes' progress over time (i.e., Chronic Disease Management templates have not been integrated into Electronic Medical Records)	X	Kelsey Trail RHA has no mechanism to collect data to track an individual with diabetes' progress over time (Noted had a mechanism (Chronic Disease Management Toolkit)), but were not allocated resources for continued use)
	✓	Saskatoon RHA has developed mechanisms to collect data on an ad hoc basis at the regional and program level	✓	Kelsey Trail RHA has developed mechanisms to collect data on an ad hoc basis at the regional and program level
	✓	Saskatoon RHA has established the Public Health Observatory[35] to collect some data on a regional basis		

[34] Estimates of direct costs identified by the RHAs do not include payments made to physicians who treat patients in their own practices, nor does it include services that HomeCare or Nurse Practitioners in Primary Health Care sites may provide. Costs of hospitalization treatment for diabetes and diabetes-related complications in an acute care setting also cannot currently be tabulated.

[35] The Public Health Observatory is responsible for population health status surveillance, monitoring and reporting; program evaluation and review; applied research; and knowledge translation and exchange. http://www.saskatoonhealthregion.ca/your_health/ps_public_health_pho_about.htm#AboutthePHO. (05 Nov. 2012).

Criteria		Saskatoon RHA		Kelsey Trail RHA
2.2 Collect and analyze data to assess progress	X	Saskatoon RHA is unable to analyze data to see if programs are reducing diabetes-related health complications or are cost effective as there is no system to collect this data	X	Kelsey Trail RHA is unable to analyze data to see if programs are reducing diabetes-related health complications or are cost effective as there is no system to collect this data
	✓	Saskatoon RHA routinely collects and analyses data to assess program attendance, client satisfaction and individual case information for some programs	✓	Kelsey Trail RHA routinely collects and analyses data to assess program attendance, client satisfaction and individual case information for some programs
	✓	Saskatoon RHA periodically collects and analyses data on the status of diabetes, and actions and programs delivered in the region (e.g., to prepare *Medical Health Officer Report on Diabetes in Saskatoon Health Region*, 2011)		
2.3 Adjust strategies and programs as required to achieve objectives	✓	Saskatoon RHA has developed a work plan for 2012-15 which includes: - identification, collection and collation of data in 2012-13 - pilot testing and implementation in 2013-14 - analysis, evaluation and decision making in 2014-15	X	Kelsey Trail RHA has no formal process to adjust strategies and programs
	✓	Program staff also adjust delivery of programs to address gaps in service delivery		
2.4 Report results publicly	✓	Saskatoon RHA periodically reports on the status of diabetes and actions and programs delivered in the region (e.g., *Medical Health Officer Report on Diabetes in Saskatoon Health Region*, 2011, and *Chronic Disease Management Annual Report*, 2012)	✓	Kelsey Trail RHA periodically reports on the status of diabetes and actions and programs delivered in the region (e.g., annual report)

Overall, from our review of two regional health authorities, we found that they are providing programs based on initiatives from the 2004 *Provincial Diabetes Plan*. However, systems do not yet exist to collect data, so RHAs cannot assess the effectiveness of their programs. Also, the Ministry has not given them current strategies, targets or guidance on resource allocations for diabetes services and prevention or reduction of diabetes-related health complications, so the RHAs cannot know if their programs are achieving the expected results.

In the absence of Ministry guidance, we encourage RHAs to share information on the design and effectiveness of their programs with each other.

8.0 EXHIBITS

Exhibit 1—Selected Program Components and Objectives from the 2004 *Provincial Diabetes Plan*

We assessed the status of implementation at March 31, 2012 based on evidence we examined during the audit.

Program Components/Objectives		Lead Agency for Objective		
		Ministry	RHA	Shared[a]
Optimum Care for Prevention of Diabetes Complications				
1	To create an infrastructure within each RHA, with senior leadership involvement, to support planning, financing, implementation and evaluation of optimal care for people with diabetes, their families and communities			Implemented
2	To create diabetes teams to address regional diabetes needs		Implemented	
3	To develop relationships with existing and developing primary care teams to ensure quality diabetes care and on-going support for people with diabetes and their families		Implemented	
4	To participate in building networks between primary care providers and teams, diabetes teams and medical care specialists		Partially Implemented	
5	To encourage and formalize processes and systems that ensure follow-up care for all regional residents with diabetes. This will require collaboration with on-reserve care providers to establish specific processes to serve First Nations on-reserve populations			Not implemented Not examined[b]
6	To develop mechanisms to reduce barriers to optimal care			Partially implemented
7	To use nationally recognized standards and guidelines in care planning and delivery			Implemented
8	To promote early diagnosis of 'impaired' glucose levels or diabetes and appropriate follow-up mechanisms.			Not examined
Diabetes Surveillance				
1	To establish a provincial surveillance system	Implemented[c]		
2	To identify intermediate and long-term indicators of outcomes, develop data collection mechanisms and analysis	Not implemented		
3	To develop, implement and evaluate an electronic system to facilitate team based management of diabetes	Not implemented		
4	To establish processes that include the participation of First Nations, Aboriginal, Métis and Inuit people in the development of an electronic system to facilitate team based management of diabetes			Not examined[b]

Source: Saskatchewan Ministry of Health. *The Provincial Diabetes Plan*. 2004.

[a] Shared in this context may refer to the Ministry, RHAs, other jurisdictions and partnering agencies.
[b] Components of on-reserve health care are provided by the Government of Canada.
[c] Canadian Chronic Disease Surveillance System contains provincial surveillance data. Surveillance data is used in the "study of the frequency, distribution and determinants of health and disease in specified populations, and the application of this study to control health problems at the population level."[36]

[36] Ministry of Health; Chief Population Health Epidemiologist.

Exhibit 2—Expanded Chronic Care Model

Source: Victoria J Barr et al; Hospital Quarterly Vol. 7, No. 1, 2003; The Expanded Chronic Care Model

The Expanded Chronic Care Model links people with their health system and community, and envisions the development of skills and provision of support to improve health outcomes for people overall and individuals with respect to their personal health outcomes. The model focuses on four areas; self-management support, decision support, delivery system design and information systems.

Exhibit 3—Modifiable Risk Factors and the Social Determinants of Health

Modifiable Risk Factors[a]	Social Determinants of Health[b]
❱ Unhealthy weight ❱ Unhealthy eating ❱ Physical inactivity ❱ Smoking	❱ Income and social status ❱ Education and literacy ❱ Employment & working conditions ❱ Social environments ❱ Physical environments ❱ Personal health practices & coping skills ❱ Healthy child development ❱ Biology and genetics ❱ Health services ❱ Gender ❱ Culture ❱ Social support networks

Source: Public Health Agency of Canada, 2011 and 2010

[a] Modifiable risk factors are those behaviors that a person can be change to reduce their risk of developing a chronic disease
[b] Social determinants of health indirectly contribute to a person's health status. There are numerous correlations between the determinants of health and the health of populations.

Exhibit 4—Basic Care Processes for People with Diabetes to be Delivered Annually

Care	Objective	Target
Self-monitoring of blood glucose	› Reinforce patient's responsibility for regular monitoring as appropriate › Ensure patient can use glucose meter, interpret SMBG results and modify treatment as needed › Develop an SMBG schedule with patient and review records	Preprandial (mmol/L) 4.0–7.0 for most patients 2-hour postprandial (mmol/L) 5.0–10.0 for most patients 5.0–8.0 if not achieving A1C target
Blood glucose control	› Measure A1C every 3 months for most adults › Consider testing at least every 6 months in adults during periods of treatment and lifestyle stability, and when glycemic targets are being consistently achieved	A1C ≤7.0% for most patients See "Targets," p. S29
Blood glucose meter accuracy	› Compare meter results with laboratory measurements at least annually, and when indicators of glycemic control do not match meter	Simultaneous fasting glucose/meter lab comparison within 20%
Hypertension	› Measure BP at diagnosis of diabetes and at every diabetes clinic visit	<130/80 mm Hg
Waist circumference	› Measure as an indicator of abdominal fat	Target WC: M <102 cm, F <88 cm (see ethnic-specific values in "Management of Obesity in Diabetes," p. S77)
Body mass index	› Calculate BMI: mass in kg/(height in m)^2	Target BMI: 18.5–24.9 kg/m^2
Nutrition	› Encourage nutrition therapy (by a Registered Dietitian) as an integral part of treatment and self-management (can reduce A1C by 1–2%)	Meet nutritional needs by following ***Eating Well with Canada's Food Guide***
Physical activity	› Discuss and encourage aerobic and resistance exercise › Consider exercise ECG stress test for previously sedentary individuals at high risk for CAD planning exercise more vigorous than brisk walking	Aerobic: ≥150 minutes/week Resistance: 3 sessions/week
Smoking	› Encourage patient to stop at each visit; provide support as needed	Smoking cessation
Retinopathy	› Type 1 diabetes: Screen 5 years after diagnosis, then rescreen annually › Type 2 diabetes: Screen at diagnosis, then every 1–2 years if no retinopathy present › Screening should be conducted by an experienced eye care professional	Early detection and treatment
Chronic kidney disease	› Identification of CKD requires screening for proteinuria using random urine ACR and assessment of renal function using a serum creatinine converted to eGFR › Type 1 diabetes: In adults, screen after 5 years duration of diabetes, then annually if no CKD › Type 2 diabetes: Screen at diagnosis, then annually if no CKD › If CKD present, perform ACR and eGFR at least every 6 months	ACR (mg/mmol) Normal: M <2.0; F <2.8 Microalbuminuria: M 2.0–20.0, F 2.8–28.0 Macroalbuminuria: M >20.0, F >28.0 CKD if eGFR ≤60 mL/min
Neuropathy/ foot examination	› Type 1 diabetes: Screen 5 years after diagnosis, then rescreen annually › Type 2 diabetes: Screen at diagnosis, then annually › Screen for neuropathy with 10-g monofilament or 128-Hz tuning fork at dorsum of great toe. In foot exam, look for structural abnormalities, neuropathy, arterial disease, ulceration, infection	Early detection and treatment If neuropathy present: foot care education, specialized footwear, smoking cessation If ulcer present: manage by multidisciplinary team with expertise
CAD assessment	› Conduct CAD risk assessment periodically: CV history, lifestyle, duration of diabetes, sexual function, abdominal obesity, lipid profile, BP, reduced pulses, bruits, glycemic control, retinopathy, eGFR,ACR › Measure baseline resting ECG, then every 2 years if: age >40 years, duration of diabetes >15 years, symptoms, hypertension, proteinuria, bruits or reduced pulses › High-risk categories include: › Men ≥45 years, women ≥50 years or › Men <45 years, women <50 years with 1 of: macrovascular disease, microvascular disease (especially retinopathy, nephropathy), multiple additional risk factors (especially family history of premature coronary or cerebrovascular disease in 1st-degree relative), extreme single risk (e.g., LDL-C >5.0 mmol/L, systolic BP >180 mm Hg) or duration of diabetes >15 years and age >30 years	Vascular protection: first priority in prevention of diabetes complications is reduction of CV risk by vascular protection through a comprehensive multifaceted approach: › All people with diabetes: optimize BP, glycemic control and lifestyle (weight, exercise, smoking) › People with diabetes and at high risk of CV event, additional interventions: ACE inhibitor/ARB antiplatelet therapy (as indicated) and lipid-lowering medication (primarily statins)
Dyslipidemia	› Measure fasting lipid levels (TC, HDL-C,TG and calculated LDL-C) at diagnosis of diabetes, then every 1–3 years as clinically indicated. Test more frequently if treatment initiated	Lipid targets for those at high risk for CAD: › Primary target: LDL-C ≤2.0 mmol/L › Secondary target:TC/HDL-C <4.0

Source: *Canadian Diabetes Association 2008 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada*

Care objectives: People with diabetes will have better outcomes if primary health care providers: 1) identify patients with diabetes in their practice; 2) assist them by incorporating the suggested care objectives; 3) schedule diabetes-focused visits; and 4) use diabetes patient care flow sheets and systematic recall for visits.

9.0 Selected References

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